From: M. B. Karr, CAPT *M. B. Karr*   OCT 7 2004
COMDT (G-MOC)

To: Distribution

Subj: EVALUATION OF STABILITY & SUBDIVISION REQUIREMENTS FOR SMALL PASSENGER VESSELS INSPECTED UNDER 46 CFR SUBCHAPTER T

Ref: (a) 46 CFR 178.330
(b) 46 CFR 178.340
(c) COMDTINST M16000.9, Marine Safety Manual, Volume IV, Chapter 6

1. <u>Purpose</u>: This memorandum provides updated guidance to Officers in Charge, Marine Inspection (OCMI) for determining the applicability of simplified stability proof tests required by reference (a). In particular we limit types of vessels that may use the simplified stability test procedures and augment reference (b) with more detailed stability test procedures for certain pontoon vessels.

2. <u>Directives Affected</u>: References (b) and (c).

3. <u>Discussion</u>:

a. <u>Simplified Stability Test for Monohull Vessels</u>: The Coast guard originally developed the simplified stability proof test currently found in reference (a) in the 1950s. The Coast Guard created this tool for OCMIs to evaluate the stability of monohull small passenger vessels. The Coast Guard wrote the regulations in 46 CFR 178.310 to apply to certain monohull small passenger vessels defined as:

- Less than 65' in length
- Carrying 150 or less passengers
- Carrying no more than 12 passengers on an international voyage
- Having only one hull
- Having no more than 1 deck above the bulkhead deck, not including a pilothouse, and
- If a sailing vessel, meets the restrictions in 46 CFR 178.325.

b. <u>Simplified Stability Test for Pontoon Vessels</u>: The Coast Guard created the pontoon simplified stability proof test currently found in reference (b) for OCMIs to evaluate the stability of lightweight pontoon small passenger vessels. The Coast Guard wrote the regulations in 46 CFR 178.340 to apply to certain pontoon small passenger vessels defined as:

- Less than 65' in length
- Carrying 49 or less passengers
- Operating only on protected waters
- Floating on only 2 separate, fully enclosed symmetric pontoons
- With no machinery or tankage in the pontoons

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- With only one deck accessible to passengers, and the accessible portion of the deck does not extend outboard of the pontoons at their outermost point, and
- Constructed with the deck no higher than 6 inches above the top of the pontoons.

c. <u>Spacing Calculations for Monohull Vessels:</u> The simplified subdivision bulkhead spacing calculations determine the maximum distance between transverse watertight bulkheads. The Coast Guard designed these regulations to place bulkheads at strategic locations throughout the vessel to limit flooding effects should the vessel become damaged below the waterline. In particular, these regulations ensure that the bulkhead deck will remain above the water if any one compartment floods. In accordance with 46 CFR 179.212, OCMIs shall perform the simplified subdivision bulkhead spacing and freeboard calculations in 46 CFR 179.220, for monohull small passenger vessels less than 65' in length that:

- Carry more than 49 passengers, or
- Are constructed of wood on or after March 11, 2001, and operate on cold water

d. <u>Other Hull Forms:</u> Since the development of the simplified stability proof test and the pontoon simplified stability proof test, we have seen owners use other hull forms for their small passenger vessels. These other hull forms include catamarans, trimarans, and other hybrid multi-hull types. Catamarans differ from pontoon vessels in that the hulls often contain machinery, tankage, and piping, the hulls may be asymmetric, and the hulls are often integral with the deck above. These vessels should not perform the monohull simplified stability proof test or the pontoon simplified stability proof test. These vessels shall submit stability calculations to the Marine Safety Center for review and approval.

4. <u>Applicability</u>: The OCMIs shall apply these guidelines to all Subchapter T vessels that require a stability test, or those whose stability, in the judgment of the OCMI, require an evaluation.

5. <u>Action:</u>

a. OCMIs should use enclosure (1) to determine the appropriate method for evaluating the stability of a small passenger vessel.

b. G-M initiated a review/assessment of the stability test procedures for pontoon vessels after the capsizing of the pontoon vessel LADY D, with the loss of 5 lives. G-MO-1, Marine Safety Center, G-MSE & G-MOC-1 developed enclosure (2). Enclosure (2) augments reference (b) by providing more detailed guidance to OCMI's when performing simplified stability tests on certain pontoon vessels.

c. What if the OCMI questions the stability of the vessel based on the results of the simplified stability test? The vessel owner must provide calculations to the Marine Safety Center showing the vessel meets the applicable stability criteria of 46 CFR Subchapter "S" in each condition of loading and operation.

d. If the vessel fails the applicable simplified stability test, or the simplified subdivision bulkhead spacing calculations, the vessel owner must provide design calculations to the Marine Safety Center showing the vessel meets the applicable stability criteria of 46 CFR Subchapter "S" in each condition of loading and operation.

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    PASSENGER VESSELS INSPECTED UNDER 46 CFR SUBCHAPTER T

e. The Marine Safety Center will continue to support OCMIs, in particular, by providing technical assistance to determine the applicability of the simplified stability proof test for unusual vessel types.

f. Due to G-M's ongoing review of stability practices, we will not incorporate enclosure (2) into the Coast Guard's Electronic Forms Library at this time. G-MOC will incorporate this guidance into a future revision of the Marine Safety Manual. Additional questions on this subject may be directed to either the Marine Safety Center or COMDT (G-MOC-1).

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Enclosure: (1) Subdivision/Stability Flowchart
            (2) Pontoon Vessel Simplified Stability Test Procedures

Distribution: G-MO-1
               G-MSE
               Marine Safety Center
               Commander, Coast Guard Atlantic Area (Am)
               Commander, Coast Guard Pacific Area (Pm)
               All District (m) Offices
               All Sector/Activities/Marine Safety Offices

- SMALL PASSENGER VESSELS -
SIMPLIFIED STABILITY TEST PROCEDURE FOR PONTOON VESSELS ON PROTECTED WATERS

(In accordance with 46 CFR 178.340)

DEPARTMENT OF
HOMELAND SECURITY
U.S. COAST GUARD

Name of Vessel _____ Documentation No. _____ Date _____

Owner/Representative _____ Inspector _____

Location _____ Wind: Relative Direction _____ Vel ____ mph

Mooring Arrangement _____ Route: Protected Only

APPLICABILITY:

This form is to be used ONLY if ALL of the following conditions are met, otherwise contact MSC:

    vessel is less than or equal to 65 feet in length
    vessel carries 49 or less passengers
    vessel operates on protected waters
    vessel is a pontoon boat, i.e. fully enclosed pontoons with no machinery or tanks inside
    vessel has only two pontoons
    vessel has outboard engines
    vessel has only one deck and the deck is less than 6 inches above pontoon tops (f_d below)
    deck accessible to passengers does not extend beyond pontoons fore/aft and port/stbd
    transverse test moment is greater than minimum test moment (see Section (2))
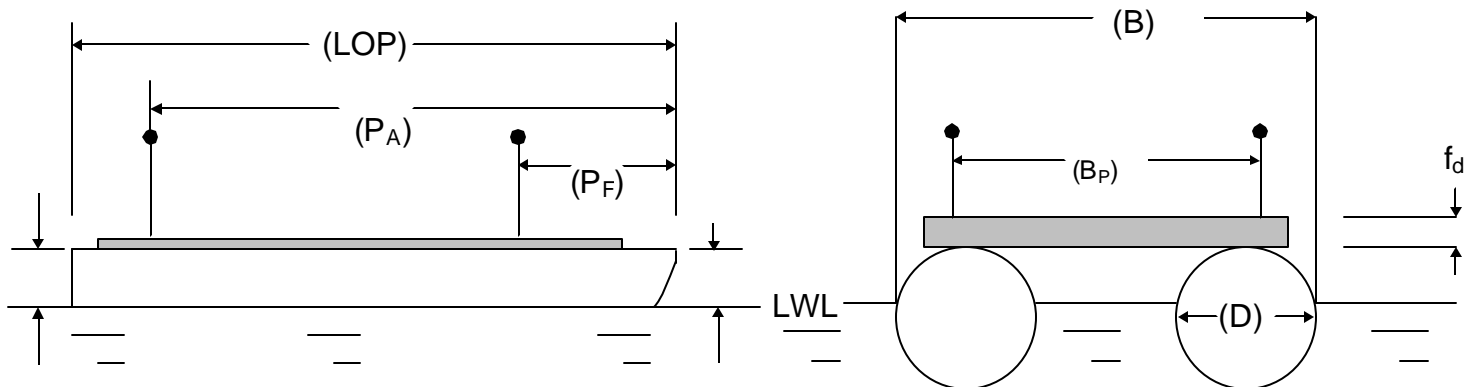
Indicate on above Sketch	Indicate on above Sketch
1) Pontoon length (LOP)	1) Maximum beam (B) to outside of pontoons
2) Distance, from pontoon bow, of furthest fwd location accessible to passengers (P_F)	2) Maximum beam (B_P) accessible to passengers
3) Distance, from pontoon bow, of furthest aft location accessible to passengers (P_A)	3) Distance (f_d) between pontoon tops & top of deck; must be less than 6 inches.
4) Freeboard at bow to pontoon top	4) Pontoon diameter (D) if circular pontoons; Pontoon underline breadth if wall-sided
5) Freeboard at stern to pontoon top	

The measurements above are to be taken in the loaded condition with trim and heel minimized.
Measurements for (LOP) and (B) are to exclude rub rails.

(1)   TOTAL TEST WEIGHT REQUIRED:

Total test weight must include the weight of passengers _and crew_.

$$\underline{\hspace{3cm}} \quad X \quad \underline{\hspace{2cm}140\hspace{1cm}} \quad = \quad \underline{\hspace{3cm}} \text{ pounds}$$
$$\text{\# of Pass.} \qquad \text{Wt/Pass.} \qquad \text{Pass. Test Wt. } (W_P)$$

$$\underline{\hspace{3cm}} \quad X \quad \underline{\hspace{2cm}160\hspace{1cm}} \quad = \quad \underline{\hspace{3cm}} \text{ pounds}$$
$$\text{\# of Crew} \qquad \text{Wt/Crew} \qquad \text{Crew Test Wt. } (W_C)$$

$$\underline{\hspace{3cm}} \quad + \quad \underline{\hspace{2cm}} \quad = \quad \underline{\hspace{3cm}} \text{ pounds}$$
$$(W_P) \qquad\qquad (W_C) \qquad\qquad \text{Total Test Wt. } (W)$$

Notes: a) "Total Test Weight" defines only the weight to be moved during the test. Weights used to represent missing equipment or stores shall be considered part of the "loaded condition."

b) The maximum number of passengers shall not exceed the number computed in accordance with 46 CFR 176.113. At no time shall the number of passengers exceed 49.

c) Weight per passenger equals 72.6 kg (160 lbs), except when passenger loads consist of men, women, and children; weight per passenger of 63.5 kg (140 lbs) may be used. Weight per crew member is 72.6 kg (160 lbs).

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(2)   MINIMUM TEST MOMENT -- SIMPLIFIED:

The calculated test moment (M_{Test}) cannot be less than the simplified minimum test moment (M_{Min1}) as calculated below:

Simplified Minimum Test Moment (M_{Min1}) = $\underline{\hspace{0.5cm}300\hspace{0.5cm}}$ lb X $\dfrac{\underline{\hspace{3cm}}}{\text{Vsl Length (LOP)}}$ = $\underline{\hspace{2cm}}$ ft-lb
                                                                                                (M_{Min1})

Calc. Test Moment (M_{Test}) = $\dfrac{\underline{\hspace{2.5cm}}}{\text{Total Test Wt. } (W)}$ X $\dfrac{\underline{\hspace{2.5cm}}}{\text{Pax. Beam } (B_P)}$ ÷ $\underline{\hspace{0.3cm}2\hspace{0.3cm}}$ = $\underline{\hspace{2cm}}$ ft-lb
                                                                                                                (M_{Test})

Simplified
Minimum Test Moment   Calculated Test Moment

$\underline{\hspace{4cm}}$ ft-lb $\underline{\hspace{4cm}}$ ft-lb
         (M_{Min1}) (M_{Test})

If (M_{Test}) is greater than or equal to (M_{Min1}) then this simplified test is valid. Skip to section (4) and continue with this test.

If (M_{Test}) is less than (M_{Min1}) then this simplified test may not be valid. Go to the next section to calculate the actual minimum test moment.

(3)   MINIMUM TEST MOMENT -- CALCULATED:

    a) If the calculated test moment is less than the simplified minimum test moment calculated in section (2) above, the actual minimum test moment must be calculated using the wind profile of the vessel.

    b) Go to Appendix A to calculate the actual minimum test moment and enter it below.

Minimum Test Moment   Calculated Test Moment
(from Appendix A)   (from section (2) above)

_____ ft-lb   _____ ft-lb
(M_{Min2}) (M_{Test})

If (M_{Test}) is greater than or equal to (M_{Min2}) then this simplified test is valid. Go to the next section and continue with this test.

If (M_{Test}) is less than (M_{Min2}) then this simplified test is not valid. Stop the test. The owner has the option to conduct a stability test (incline or deadweight survey) and submit calculations to MSC. Contact MSC if you have questions.

(4)   VESSEL CONDITION PRIOR TO & DURING TESTS:

    a) The test shall be conducted with all tanks ¾ full, ballast onboard and in place, and any non-return valves or flaps on scuppers or deck drains restrained in the open position.

    b) The test shall be conducted with the vessel in the full load condition. Any items, such as chairs, coolers, and deck coverings, which are not onboard at the time of the test shall be simulated by the use of weights approximating the weight and location of the missing items. These simulated weights are not to be shifted during any of the following tests.

    c) The vessel shall be fully afloat and all mooring lines are to be slack during the test.

    d) If the vessel carries passengers on diving excursions, the total weight of diving gear must be included in the loaded condition. Diving gear is assumed to be 36 kg (80 lbs) person.

    e) During the loading and moving of test weights, care should be taken if there is any evidence of low stability. This may be assumed to be the case whenever the effect of any added or shifted weight increment is noted to be more than that of the preceding increment of the same size, or when one of the pontoons comes out of the water or is submerged as a result of the heel.

    f) Care is to be exercised that the vessel is not heeled excessively either due to weight movement or superimposed roll which could cause the test weights to topple or the ship's gear to become adrift.

    g) Before the vessel is heeled, check for open seams, loose hull fittings, etc., which are not normally immersed and which could cause flooding of the vessel.

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(5)   TRANSVERSE STABILITY TEST – DISTRIBUTION OF TEST WEIGHT:

a) Distribute test weights so as to minimize heel and trim.
b) Arrange the test weight so that its vertical center of gravity (VCG) is approximately 76.2 cm (30 inches) above the deck
c) The vertical distribution of the test weight shall be such as to simulate the most unfavorable VCG likely to occur in service.

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(6)   TRANSVERSE STABILITY TEST – DETERMINATION OF METHOD:

a) If the pontoons have a circular cross section, proceed to Appendix B.
b) If the pontoons are wall-sided, proceed to Appendix C.
c) For all other pontoon shapes, this test may not be applicable – please contact the Marine Safety Center for further guidance.

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(7)   TRANSVERSE STABILITY TEST – TEST RESULTS:

The vessel passes this test if the vessel meets the requirements of Appendix B or C as applicable.

This vessel **PASSED** the transverse stability test. Continue with Longitudinal Stability Test.

OR

This vessel **FAILED** the transverse stability test. Stop the test.   Remove a few passengers (test weight), print a new test form and start the form over, beginning with page 1 of the form.

If the vessel cannot pass this simplified test, the owner has the option to conduct a stability test (incline or deadweight survey) and submit calculations to MSC.
Contact MSC if you have questions.

(8)   LONGITUDINAL STABILITY TEST – WEIGHT MOVEMENT:

a) The trimming moment shall be obtained by a longitudinal movement of the test weight from Section (1) to the extreme forward or aft position of the deck available to passengers and crew, whichever position is further from the initial position of the load.
b) All other notes from Section (4) shall be observed.

Quantity	Weight per Unit	Subtotal Weight (Quant. x Wt. per Unit)	Distance Moved

Total Weight

Check: This should be equal to or greater than the Test Weight from Section (1)

**(9)   LONGITUDINAL STABILITY TEST – TEST RESULTS:**

The vessel passes this test if the tops of the pontoons are not submerged at any location with the weights shifted as indicated above. See the figure below.

This vessel **PASSED** the longitudinal stability test.

This vessel **FAILED** the longitudinal stability test. Stop the test.
Remove a few passengers (test weight) print a new test form and start the form over, beginning with page 1 of the form.

If the vessel cannot pass this simplified test, the owner has the option to conduct a stability test (incline/deadweight survey) and submit calculations to MSC. Contact MSC if you have questions.
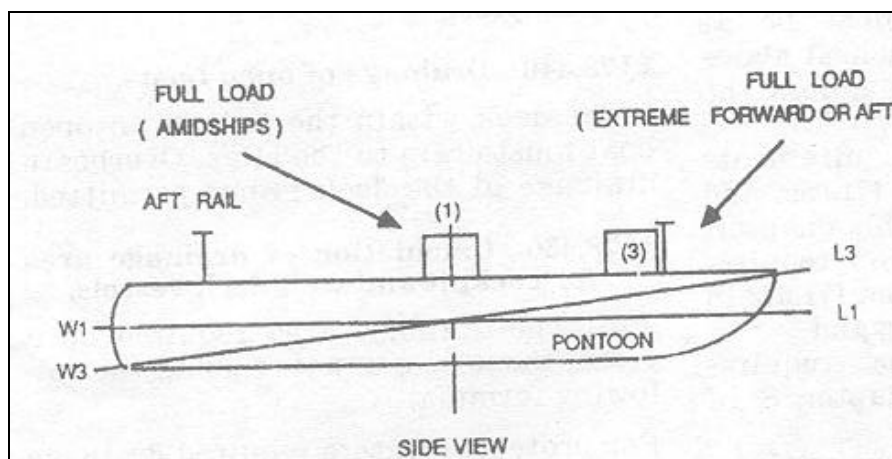
46 CFR Figure 178.340(d)(2)

(10)   GENERAL STABILITY INFORMATION

Tankage:

Tank	Capacity	Approximate Location of CG @ 100% Cap.	
		Aft of Pontoon Bow	Above Top of Keel

Ballast:

| Material	Weight	Approximate Location of CG	
		Aft of Pontoon Bow	Above Top of Keel

APPENDIX A
CALCULATION OF MINIMUM TEST MOMENT BY WIND AREA

(A)   HOW TO USE THIS APPENDIX

To determine the calculated minimum test moment, follow the steps below:

a) Block off the profile of the vessel into rectangles using <u>vertical</u> lines starting at the
waterline, as shown below. Include passenger railings, canopies, and spotting towers.
b) Measure, on the vessel, the length (L) and height (V) of each rectangle and enter into
the table below.
c) Complete the calculations in the table, add the products in the last column and follow
the calculations to determine if this test is applicable.
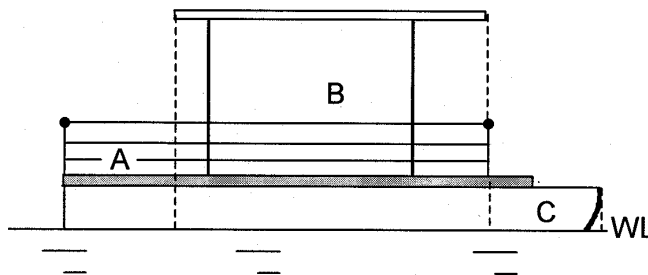
APPENDIX A
CALCULATION OF MINIMUM TEST MOMENT BY WIND AREA

(B)   SKETCH OF VESSEL PROFILE

<u>Profile</u>

Load Waterline   Scale: 1 square = _____

(C)   CALCULATION OF MINIMUM TEST MOMENT

<u>Calculations</u>

Section	L	V	A (L x V)	H (½ V)	A x H
A					
B					
C					
D					
E					
F					

Sum of (A x H) = _____

Minimum Test Moment (M_{Min2}) = $\underline{\text{7.5 lbs/ sq. ft.}}$ X _____ = _____ ft-lbs
                                   Wind Pressure (P)   Sum (A x H)   (M_{Min2})

Enter (M_{min2}) into the appropriate block in section (3) of this test form.

APPENDIX B
CALCULATION OF AREAS FOR <u>CIRCULAR</u> PONTOONS
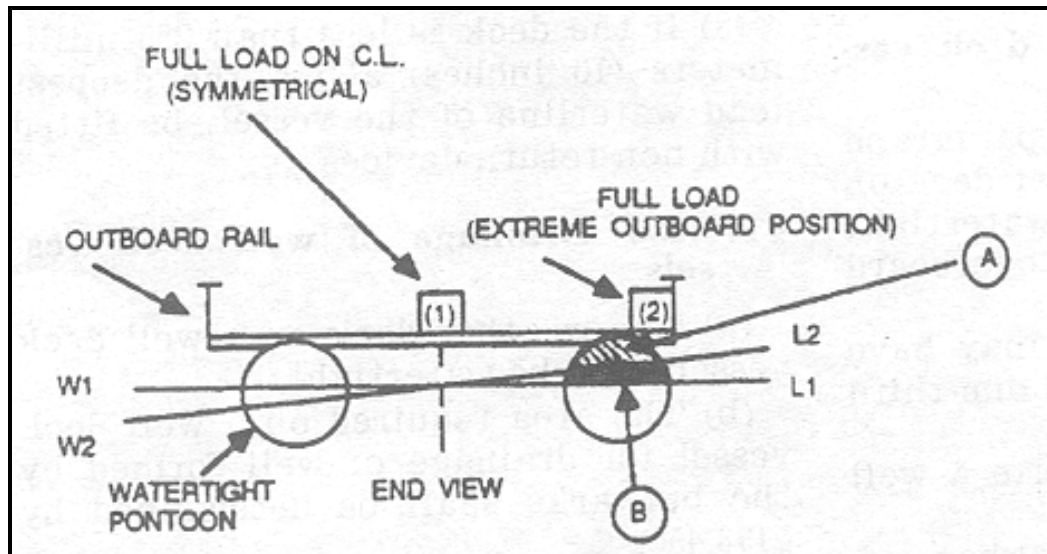
46 CFR Figure 178.340(d)(1)
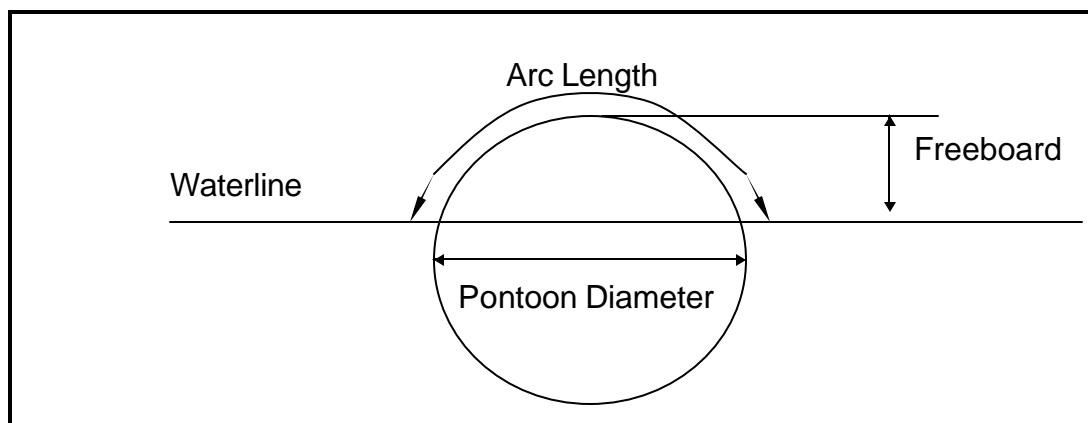
Pontoon Measurement Guide

(A)   PONTOON SIZE

Pontoon Diameter = _____ inches

Pontoon Radius = diameter ÷ 2 = _____ inches

APPENDIX B
CALCULATION OF AREAS FOR <u>CIRCULAR</u> PONTOONS

(B)   AREA ABOVE WATERLINE BEFORE WEIGHT MOVEMENT (AREA *A+B*)

Measured arc length = _____ inches

Ratio 1 = _____ ÷ _____ x __57.3__ = _____
          (arc length)   (Pontoon radius)   (Ratio 1)

Enter *table* (last two pages of this appendix) with this value and find the closest number in the column labeled *(Ratio 1);* read the value to the right in the column labeled *(Ratio 2)* and enter that number below:

Ratio 2 *(from table)* =_____

Area = _____ X _____ X _____ = [_____] sq in.
       (Ratio 2)   (Pontoon Radius)   (Pontoon Radius)   (Area A+B)

(C)   WEIGHT MOVEMENT

The heeling moment shall be obtained by a transverse movement of the test weight from Section (1) to the extreme outboard position of the deck available to passengers and crew on the side with the least initial freeboard.

Quantity	Weight per Unit	Subtotal Weight (Quant. x Wt. per Unit)	Distance Moved
	Total Weight		

<u>Check</u>:   This should be equal to or greater than the Test Weight from Section (1)

APPENDIX B
CALCULATION OF AREAS FOR <u>CIRCULAR</u> PONTOONS

(D)   AREA ABOVE WATERLINE AFTER WEIGHT MOVEMENT (AREA *A*)

Measured arc length = _____ inches

Ratio 1 = _____ ÷ _____ x __57.3__ = _____
            (arc length)   (Pontoon radius)   (Ratio 1)

Enter *table* (last two pages of this appendix) with this value and find the closest number in the column labeled *(Ratio 1);* read the value to the right in the column labeled *(Ratio 2)* and enter that number below:

Ratio 2 *(from table)* =_____

Area = _____ X _____ X _____ = [_____] sq in.
          (Ratio 2)   (Pontoon Radius)   (Pontoon Radius)   (Area A)

(E)   AREA SUBMERGED DUE TO WEIGHT MOVEMENT (AREA *B*)

Area = _____ - _____ = [_____] sq in.
          (Area A+B)   (Area A)   (Area B)

(F)   TEST RESULTS

Pontoon area above waterline after   Pontoon area submerged due to
weight movement from Section (D)   weight movement from Section (E)

_____ sq. in.   _____ sq. in.
          (Area A)   (Area B)

If (Area A) is greater than or equal to (Area B) then vessel passed test. Continue with
Longitudinal Stability Test

If (Area A) is less than (Area B) then stop the test. Remove a few passengers (test weight), print
a new test form and start the form over, beginning with page 1 of the form.

Return to Test Form – Section (7)

APPENDIX B
CALCULATION OF AREAS FOR <u>CIRCULAR</u> PONTOONS

Ratio 1	Ratio 2	Ratio 1	Ratio 2	Ratio 1	Ratio 2	Ratio 1	Ratio 2
1	0.00000	46	0.04176	91	0.2942	136	0.8395
2	0.00000	47	0.04448	92	0.3032	137	0.8546
3	0.00001	48	0.04731	93	0.3123	138	0.8697
4	0.00003	49	0.05025	94	0.3215	139	0.8850
5	0.00006	50	0.05331	95	0.3309	140	0.9003
6	0.00010	51	0.05649	96	0.3405	141	0.9158
7	0.00015	52	0.05978	97	0.3502	142	0.9314
8	0.00023	53	0.06319	98	0.3601	143	0.9470
9	0.00032	54	0.06673	99	0.3701	144	0.9627
10	0.00044	55	0.07039	100	0.3803	145	0.9786
11	0.00059	56	0.07417	101	0.3906	146	0.9945
12	0.00076	57	0.07808	102	0.4010	147	1.0105
13	0.00097	58	0.08212	103	0.4117	148	1.0266
14	0.00121	59	0.08629	104	0.4224	149	1.0428
15	0.00149	60	0.09059	105	0.4333	150	1.0590
16	0.00181	61	0.09502	106	0.4444	151	1.0753
17	0.00217	62	0.09958	107	0.4556	152	1.0917
18	0.00257	63	0.10428	108	0.4669	153	1.1082
19	0.00302	64	0.10911	109	0.4784	154	1.1247
20	0.00352	65	0.11408	110	0.4901	155	1.1413
21	0.00408	66	0.11919	111	0.5019	156	1.1580
22	0.00468	67	0.12443	112	0.5138	157	1.1747
23	0.00535	68	0.12982	113	0.5259	158	1.1915
24	0.00607	69	0.13535	114	0.5381	159	1.2084
25	0.00686	70	0.14102	115	0.5504	160	1.2253
26	0.00771	71	0.14683	116	0.5629	161	1.2422
27	0.00862	72	0.15279	117	0.5755	162	1.2592
28	0.00961	73	0.15889	118	0.5883	163	1.2763
29	0.01067	74	0.16514	119	0.6012	164	1.2934
30	0.01180	75	0.17154	120	0.6142	165	1.3105
31	0.01301	76	0.17808	121	0.6273	166	1.3277
32	0.01429	77	0.18477	122	0.6406	167	1.3449
33	0.01566	78	0.19160	123	0.6540	168	1.3621
34	0.01711	79	0.19859	124	0.6676	169	1.3794
35	0.01864	80	0.20573	125	0.6813	170	1.3967
36	0.02027	81	0.21301	126	0.6950	171	1.4140
37	0.02198	82	0.22045	127	0.7090	172	1.4314
38	0.02378	83	0.22804	128	0.7230	173	1.4488
39	0.02568	84	0.23578	129	0.7372	174	1.4662
40	0.02767	85	0.24367	130	0.7514	175	1.4836
41	0.02976	86	0.25171	131	0.7658	176	1.5010
42	0.03195	87	0.25990	132	0.7803	177	1.5184
43	0.03425	88	0.26825	133	0.7950	178	1.5359
44	0.03664	89	0.27675	134	0.8097	179	1.5533
45	0.03915	90	0.28540	135	0.8245	180	1.5708

APPENDIX B
CALCULATION OF AREAS FOR <u>CIRCULAR</u> PONTOONS

| Ratio 1	Ratio 2	Ratio 1	Ratio 2	Ratio 1	Ratio 2	Ratio 1	Ratio 2
181	1.5882	226	2.3319	271	2.86484	316	3.10245
182	1.6057	227	2.3466	272	2.87334	317	3.10495
183	1.6231	228	2.3612	273	2.88169	318	3.10735
184	1.6406	229	2.3758	274	2.88988	319	3.10964
185	1.6580	230	2.3902	275	2.89793	320	3.11183
186	1.6754	231	2.4044	276	2.90582	321	3.11392
187	1.6928	232	2.4186	277	2.91355	322	3.11591
188	1.7102	233	2.4326	278	2.92114	323	3.11781
189	1.7276	234	2.4465	279	2.92858	324	3.11961
190	1.7449	235	2.4603	280	2.93586	325	3.12133
191	1.7622	236	2.4740	281	2.94300	326	3.12295
192	1.7795	237	2.4876	282	2.94999	327	3.12448
193	1.7967	238	2.5010	283	2.95683	328	3.12593
194	1.8139	239	2.5143	284	2.96352	329	3.12730
195	1.8311	240	2.5274	285	2.97006	330	3.12859
196	1.8482	241	2.5404	286	2.97645	331	3.12979
197	1.8653	242	2.5533	287	2.98270	332	3.13092
198	1.8824	243	2.5661	288	2.98880	333	3.13198
199	1.8994	244	2.5787	289	2.99476	334	3.13297
200	1.9163	245	2.5912	290	3.00057	335	3.13389
201	1.9332	246	2.6035	291	3.00624	336	3.13474
202	1.9501	247	2.6157	292	3.01177	337	3.13552
203	1.9669	248	2.6278	293	3.01716	338	3.13625
204	1.9836	249	2.6397	294	3.02241	339	3.13691
205	2.0003	250	2.6515	295	3.02751	340	3.13752
206	2.0169	251	2.6631	296	3.03248	341	3.13807
207	2.0334	252	2.6746	297	3.03732	342	3.13857
208	2.0499	253	2.6860	298	3.04201	343	3.13902
209	2.0663	254	2.6972	299	3.04658	344	3.13943
210	2.0826	255	2.7083	300	3.05101	345	3.13978
211	2.0988	256	2.7192	301	3.05530	346	3.14010
212	2.1150	257	2.7299	302	3.05947	347	3.14038
213	2.1311	258	2.7405	303	3.06351	348	3.14062
214	2.1471	259	2.7510	304	3.06742	349	3.14083
215	2.1630	260	2.7613	305	3.07120	350	3.14100
216	2.1788	261	2.7715	306	3.07486	351	3.14115
217	2.1946	262	2.7815	307	3.07840	352	3.14127
218	2.2102	263	2.7914	308	3.08181	353	3.14137
219	2.2258	264	2.8011	309	3.08511	354	3.14144
220	2.2413	265	2.8107	310	3.08828	355	3.14150
221	2.2566	266	2.8201	311	3.09134	356	3.14154
222	2.2719	267	2.8293	312	3.09429	357	3.14156
223	2.2870	268	2.8384	313	3.09712	358	3.14158
224	2.3021	269	2.8474	314	3.09984	359	3.14159
225	2.3170	270	2.8562	315	3.10245	360	3.14159

APPENDIX C
# CALCULATION OF AREAS FOR <u>WALL-SIDED</u> PONTOONS

(A)   APPLICABILITY

This appendix is applicable for the following shapes with the following restrictions:

1) <u>Rectangular/square pontoons</u>: This test is applicable without restriction.

2) <u>Flared pontoons</u>: This test is applicable for pontoons with flared hulls, not those with tumble-home (see pictures below). The width of the pontoon (B_{PONT}) must be measured **at the waterline**.
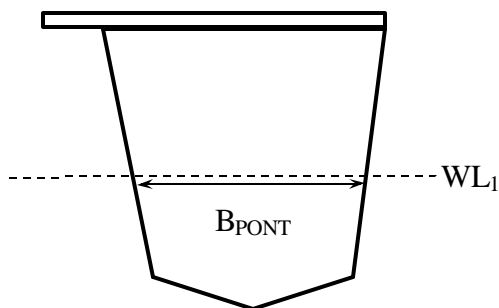
Pontoon with flare
This test is APPLICABLE
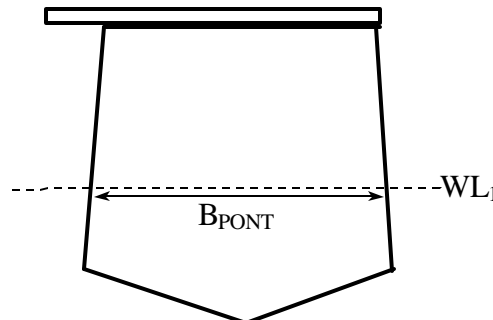
Pontoon with tumblehome
This test is NOT APPLICABLE
Submit calculations to MSC

3) <u>Rounded/chine bottoms</u>: This test is applicable as long the chine or turn of the bilge is underwater during the entire transverse stability test. If any part of the chine or turn of the bilge comes out of the water during the test, stop the test.

4) <u>Unusually-shaped pontoons</u>: If the pontoon is not similar to those shown above, contact MSC to determine applicability of pontoon simplified stability test.
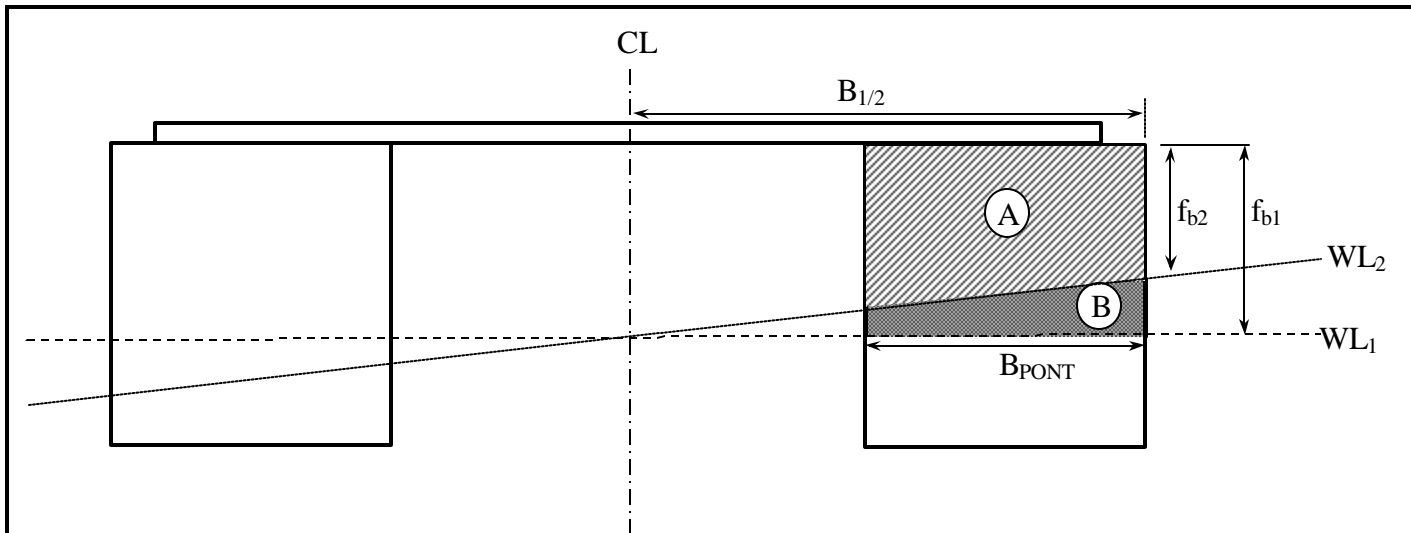
Pontoon Measurement Guide

APPENDIX C
CALCULATION OF AREAS FOR <u>WALL-SIDED</u> PONTOONS

(B)   VESSEL HALF-BEAM

Vessel's ½-beam (centerline to outboard edge of pontoon at pontoon top) measured at same longitudinal location as freeboard measurement = _____ inches

$$(B_{1/2})$$

(C)   VESSEL CONDITION BEFORE WEIGHT MOVEMENT

Width of pontoon <u>at waterline</u> at same location as freeboard measurement = _____ inches

$$(B_{PONT})$$

Check: B_{PONT} must be less than or equal to $B_{1/2}$. If not, this test is not valid. Stop the test.

Freeboard; waterline to top of pontoon = _____ inches

$$(fb_1)$$

(D)   WEIGHT MOVEMENT

The heeling moment shall be obtained by a transverse movement of the test weight from Section (1) to the extreme outboard position of the deck available to passengers and crew on the side with the least initial freeboard.

Quantity	Weight per Unit	Subtotal Weight (Quant. x Wt. per Unit)	Distance Moved
	Total Weight		

<u>Check</u>:   This should be equal to or greater than the Test Weight from Section (1)

APPENDIX C
CALCULATION OF AREAS FOR <u>WALL-SIDED</u> PONTOONS

(E)   VESSEL CONDITION AFTER WEIGHT MOVEMENT

Freeboard; waterline to top of pontoon = _____ inches
$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ (fb$_2$)

(F)   TEST RESULTS

Width Ratio = _____ ÷ _____ = _____
$\qquad\qquad$ (B$_{PONT}$) $\qquad$ (B$_{1/2}$) $\qquad\qquad$ (WR)

Line 1 = _____1_____ - _____ = _____
$\qquad\qquad\qquad\qquad$ (WR) $\qquad\qquad$ (Ans 1)

Line 2 = _____2_____ - _____ = _____
$\qquad\qquad\qquad\qquad$ (WR) $\qquad\qquad$ (Ans 2)

Criteria = _____ X _____ ÷ _____ = | _____ in. |
$\qquad\quad$ (fb1) $\qquad\quad$ (Ans 1) $\qquad\quad$ (Ans 2) $\qquad$ (Criteria)

$\qquad\qquad$ Freeboard taken after weight $\qquad\qquad\qquad$ Result of (Criteria) calculation from
$\qquad\qquad\qquad$ movement from Section (E) $\qquad\qquad\qquad\qquad\qquad$ line above

$\qquad\qquad$ _____ in. $\qquad\qquad\qquad\qquad$ _____ in.
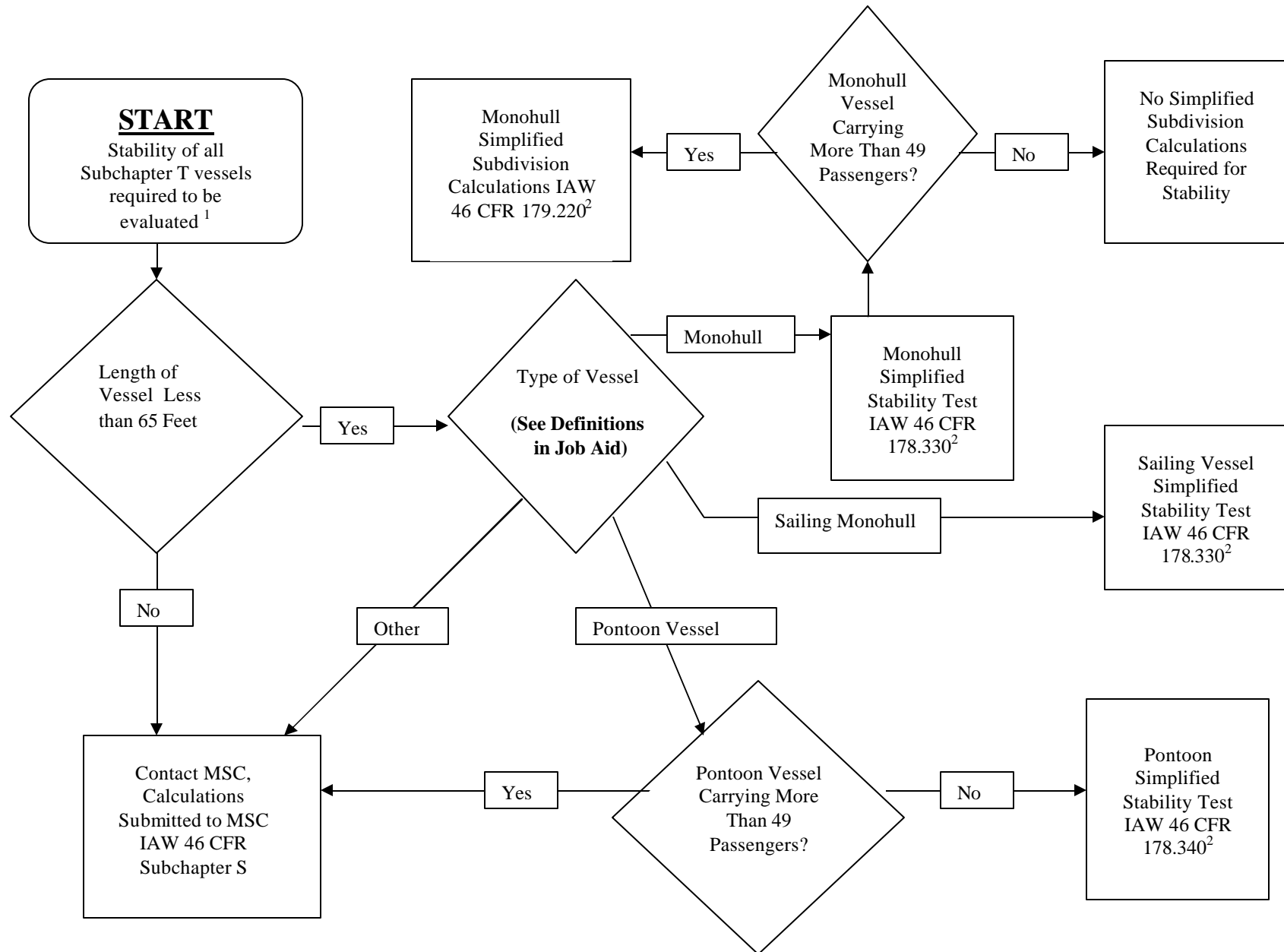$\qquad\qquad\qquad\qquad$ (fb$_2$) $\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ (Criteria)

If (fb$_2$) is greater than or equal to (Criteria) then vessel passed test. Continue with Longitudinal
Stability Test

If (fb$_2$) is less than (Criteria), then stop the test. Remove a few passengers (test weight), print a
new test form and start the form over, beginning with page 1 of the form.

Return to Test Form – Section (7)

Flowchart to Determine the Applicability of Simplified Stability Tests & Simplified Subdivision Bulkhead Spacing Calculations for Small Passenger Vessels Inspected Under 46 CFR Subchapter T

START
Stability of all Subchapter T vessels required to be evaluated [1]

Length of Vessel Less than 65 Feet

Yes →

No ↓

Type of Vessel

(See Definitions in Job Aid)

Monohull →

Monohull Simplified Stability Test IAW 46 CFR 178.330[2]

Monohull Vessel Carrying More Than 49 Passengers?

Yes → Monohull Simplified Subdivision Calculations IAW 46 CFR 179.220[2]

No → No Simplified Subdivision Calculations Required for Stability

Sailing Monohull → Sailing Vessel Simplified Stability Test IAW 46 CFR 178.330[2]

Other → Contact MSC, Calculations Submitted to MSC IAW 46 CFR Subchapter S

Pontoon Vessel → Pontoon Vessel Carrying More Than 49 Passengers?

Yes → Contact MSC, Calculations Submitted to MSC IAW 46 CFR Subchapter S

No → Pontoon Simplified Stability Test IAW 46 CFR 178.340[2]

Note 1: Unless specifically waived by the OCMI in accordance with 46 CFR 178.320(c).
Note 2: If the vessel fails the simplified stability test or bulkhead spacing calculations, the vessel must be shown by design calculations submitted to MSC to meet the applicable stability criteria of 46 CFR Subchapter S in each loading and operation.